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AIR CLEANER CONTAINING HONEYCOMB ELEMENT HAVING CONICAL PORTION

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[There are no amendments to this utility model.]

Claim

A type of air cleaner containing a honeycomb element having a conical portion characterized by the following facts: a flat sheet shaped filtering material and a corrugated sheet shaped filtering material tapered in the longitudinal direction are superimposed on each other and wrapped side on a wrapping core starting from the wide; the terminating ends of said filtering materials are fixed; the crests on one end and the troughs on the other end are sealed off

alternately to form a cylindrical honeycomb element having a conical portion; and said element is contained in a cylindrical housing having an inlet pipe and an outlet pipe.

Detailed explanation of the device

The present device pertains to a type of air cleaner containing a honeycomb element. In particular, the present invention pertains to improvement of the shape of the honeycomb element.

Figure 1 is a longitudinal cross section illustrating air cleaner A containing honeycomb element E in the prior art. Said honeycomb element E is prepared as follows: flat sheet shaped filtering material G and corrugated sheet shaped filtering material H are superimposed on each other and are wrapped around wrapping core F, and the crests on one end and the troughs on the other end are alternately sealed off to form open ends J and closed ends K. The honeycomb element is then contained in cylindrical housing B connected to inlet pipe C and outlet pipe D. Seals L_1, L_2 prevent leaks to the atmosphere from honeycomb element E inside of housing B. Honeycomb element E and housing B are then fixed. As shown in the figure, said honeycomb element E has a rectangular cross section, with open ends J and closed ends K formed alternately in it to form flow channels M. As the dust-containing air flows in from inlet pipe C, it passes from open ends J on the side of inlet pipe C through flow channels M indicated by arrows, and flows out from open ends J on the side of outlet pipe D. Dust is thereby captured, and only clean air can drawn into the engine (not shown in the figure) from outlet pipe D. In this conventional air cleaner A, however, the air flow from inlet pipe C is prone to become turbulent flow before entering honeycomb element E. Also, with respect to the flow velocity in flow channels M near wrapping core F and in flow channels M near housing B, the flow velocity on the side of wrapping core F is higher, and the flow velocity of air flowing through flow channels M in honeycomb element E is uneven. Also, the total area (filtering area) of flow channels M depends on the length in the axial direction of honeycomb element E, the filtering area is small, and the quantity of dust that can be held is small, that is, the working life is short. This is undesirable.

The objective of the present device is to solve the aforementioned problems of the prior art by providing a type of air cleaner containing a honeycomb element having a conical portion characterized by the following facts: a flat sheet shaped filtering material and a corrugated sheet shaped filtering material tapered in the longitudinal direction are superimposed on each other and are wrapped on a wrapping core starting from the wide side; the terminating ends of said filtering materials are fixed; the crests on one end and the troughs on the other end are sealed off alternately to form a cylindrical honeycomb element having a conical portion; and said element is contained in a cylindrical housing having an inlet pipe and an outlet pipe. In the following, the present device will be explained with reference to figures.

Figure 2(A) is a partial cross section illustrating the situation when improved honeycomb element (4) is contained in housing (1) used in the prior art.

Said honeycomb element (4) is prepared as follows. A flat sheet shaped filtering material and a corrugated sheet shaped filtering material having width H_1 at the starting end and width H_2 at the terminating end (here, H_1 is larger), with only the upper edge tapering smaller as shown in Figure 2(B), are superimposed and are wrapped on wrapping core (5) starting from the wider side. The terminating ends are fixed. Then, just as in the prior art, the crests on one end and the troughs on the other end are alternately sealed off, forming conical portion (7). The cylindrical part obtained is shown in Figure 2(C) in an oblique view. (2) represents the inlet pipe; (3) represents the outlet pipe; and (8), (9) are seals. Said housing (1) and honeycomb element (4) are fixed at the positions of seals (8), (9).

In this air cleaner (10), said conical portion (7) acts as an air guide for the air flowing in from inlet pipe (2), so that the flow becomes nearly laminar, and flow channel (6) at the periphery of wrapping core (5) is longer.The resistance becomes higher as a result, and the flow velocity is reduced. The flow velocity in the flow channels in honeycomb element (4) becomes uniform. Also, the conical portion increases the filtering area, so that the quantity of dust that is caught is increased, that is, the working life becomes longer.

Figure 3 shows the case when said honeycomb element (4) having said conical portion is used in a state opposite to that shown in Figure 2(A) relative to the inlet pipe and outlet pipe.

In Figure 4(A), conical portions are provided on both sides of a cylindrical honeycomb element. As shown in Figure 4(B), the honeycomb element is formed in the same way as previously described using sheets that are tapered on both top and bottom, with wider side H_3 and narrower side H_4. As a result, even when the inlet pipe and outlet pipe are at nearly right angles with respect to the axis of the honeycomb element, the structure is effective in producing a uniform flow velocity in the element and in prolonging the working life.

Figure 5 is a cross section illustrating the state when the inlet and outlet pipe are coaxial with a honeycomb element having conical portions on both ends. As a result, it is easy to realize the most uniform state of flow in the honeycomb element flow channels, and the effect in prolonging the working life is also excellent. Figure 6 is a schematic longitudinal cross section illustrating the state when honeycomb element (14) having conical portion (17) in is used an inline cyclone air cleaner (20).

The center at one end of cylindrical housing (11) forms the closed portion. Inlet portion (12) having louver (15) is arranged on its periphery. From the inner periphery of louver (15), guide (16) is arranged nearly parallel to the apex angle of said conical portion (17). On the outer periphery of honeycomb element (14) near outlet pipe (13), a steel sheet metal, for example, is

wrapped to form element guide (18). Dust discharge device (21) is installed in the lower portion. (Discharge device (21) is usually composed of dust collecting pipe (19) and valve (22)).

In this air cleaner (20), dust consisting of coarse particles is collected and doscharged into discharge device (21) due to the centrifugal action of louver (15), guide (16) and element guide (18). The fine dust not centrifugally separated is cleaned by honeycomb element (14) having conical portion (17), so that only this cleaned air passes through outlet pipe (13) and it is drawn into the engine not shown in the figure.

As explained above in the application examples, according to the present device, conical portion is provided on one or both ends of a honeycomb element having a rectangular cross section, and it is contained inside a housing of any of a variety of types having an inlet pipe and outlet pipe. Because the air flow velocity becomes more uniform in the honeycomb element, and the filtering area is greater larger, the working life of the element can be prolonged without increasing the initial air flow resistance.

Brief description of the figures

Figure 1 is a longitudinal cross section illustrating the prior art. Figure 2A is a partial cross section illustrating the element of the present device contained in a conventional housing. Figure 2B is a plan view illustrating the filtering materials. Figure 2C is an oblique view of the element. Figure 3 is a cross section illustrating the state when the air cleaner is used in a configuration opposite to that shown in Figure 2A. Figure 4A is a cross section illustrating an example of using an element with conical portions on both ends. Figure 4B is a plan view illustrating its filtering material. Figure 5 is a cross section illustrating an example of a coaxial configuration. Figure 6 is a longitudinal cross section illustrating another application example.

1, 11, B	Housing
2, C	Inlet pipe
3, 13, D	Outlet pipe
4, 14, E	Honeycomb element
5, F	Wrapping core
7, 17	Conical portion
10, 20, A	Air cleaner

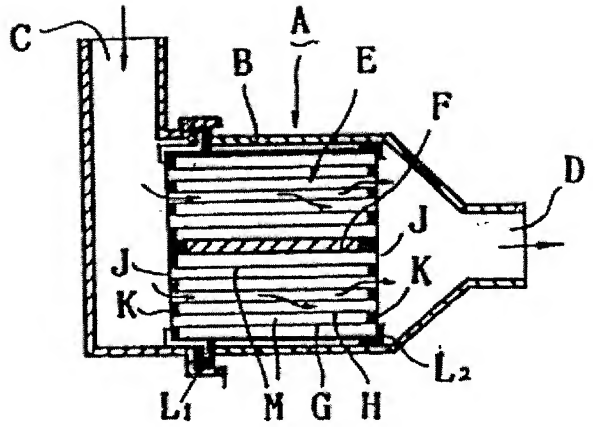

Figure 1

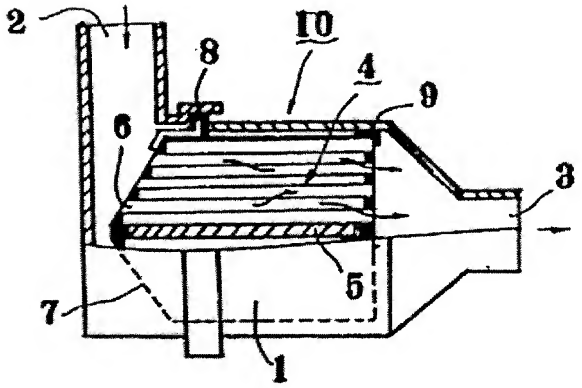

Figure 2A

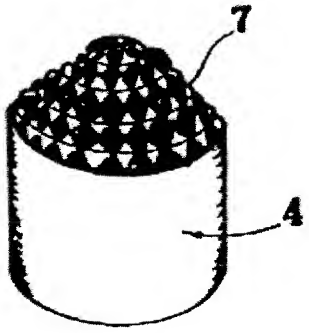

Figure 2B

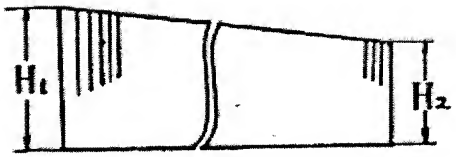

Figure 2C

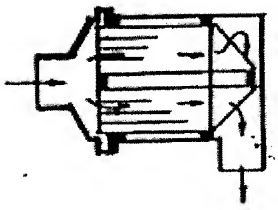

Figure 3

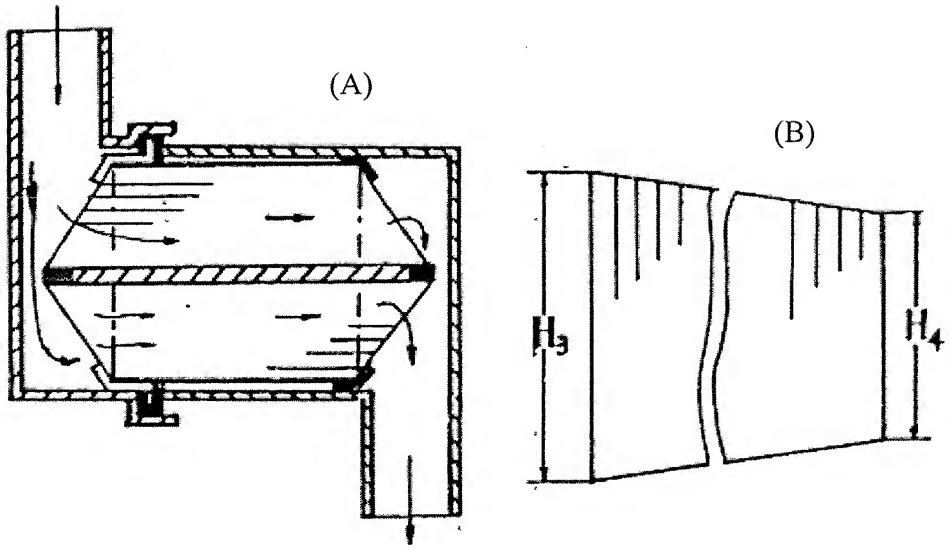

Figure 4

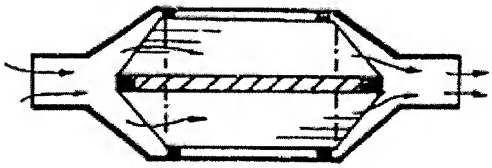

Figure 5

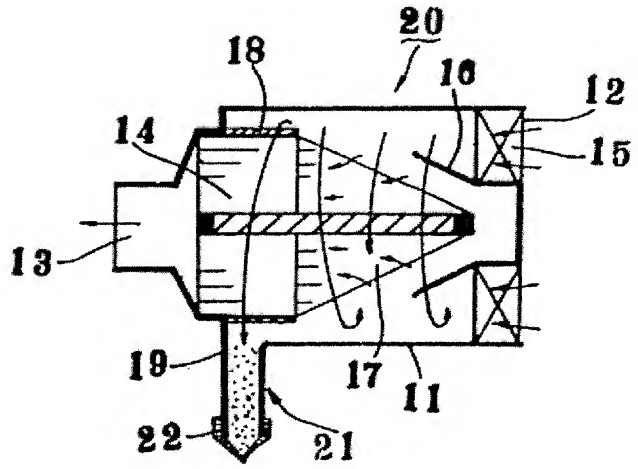

Figure 6